Assignment 5

Engine Maintenance (cont'd)

Textbook Assignment: Engineman 1&C, NAVEDTRA 10543-E1, Pages 3-25 through 3-41

Learning Objective: Describe the types of piston and rod assemblies used in internal combustion engines, recognize symptoms of malfunctions and their causes, and indicate the type of actions that may prevent the recurrence of such troubles.

● Question 5-1 is to be judged either True or False.

5-1. Before attempting to jack an internal combustion engine over by hand, you should first disable the starter circuit.

5-2. Which of the following symptoms indicate(s) that the clearance between the piston and cylinder is above tolerance?

1. Excessive oil consumption
2. Piston slap after top dead center
3. Piston slap after bottom dead center
4. All of the above

5-3. On Navy engines, piston defects are NOT likely to be caused by which of the following conditions?

1. Unbalanced load
2. Insufficient lubrication
3. Crown and land dragging
4. Excessive piston liner clearance

5-4. Operation of an internal combustion engine above the specified temperature limits may result in which of the following problems?

1. No lubrication of the cylinder walls
2. Low cylinder temperatures
3. Increased oil viscosity
4. High oil temperatures

5-5. If the oil flow to a piston is restricted, where will the oxidation of the oil cause deposits to form?

1. On the underside of the piston crown
2. Behind the compression rings
3. On the piston walls
4. On the piston crown

5-6. When the clearance between the piston and the cylinder liner is too small, the piston will NOT likely

1. seize
2. bind
3. break
4. wear in

5-7. The wiping of metal causes the rings to stick in the piston grooves. What is this action called?

1. Scoring
2. Scuffing
3. Calling
4. Wiping

5-8. Which of the following actions is/are required to balance the load on each piston of an auxiliary generator diesel engine?

1. Setting the fuel rack
2. Checking the compression pressures
3. Checking the firing pressures
4. All of the above

5-9. Cracking of the ring groove lands on a piston can be attributed to which of the following conditions?

1. Excessive piston-to-cylinder clearance
2. Insufficient clearance between the ends of the rings
3. Insufficient ring-to-land clearance
4. Each of the above

5-10. Which of the following corrective actions is recommended for pistons that are excessively worn?

1. Plating the piston
2. Replacing the piston
3. Resizing the piston
4. Metal spraying the piston

5-11. Which of the following conditions may cause low compression pressures that might affect several or all cylinders of an auxiliary diesel engine?

1. A leaking cylinder valve
2. A clogged air filter
3. A clogged intake port
4. A leaking after-chamber

5-12. Which of the following factors may cause excessive oil consumption during engine operation?

1. Worn oil rings
2. Use of improper oil
3. High lube oil temperatures
4. Each of the above

5-13. Which of the following symptoms may be indicative of excessively worn piston rings?

1. High compression
2. Hard starting
3. Clear exhaust
4. All of the above

5-14. Carbon deposits that limit the flexing movements of piston rings are usually formed when an engine is operated under which of the following conditions?

1. Excessive operating temperatures
2. High cooling temperatures
3. Improper balance
4. Improper load

5-15. Which of the following factors may cause a piston ring to extend into a port of a ported cylinder?

1. Excessive engine speeds
2. Insufficient gap clearance
3. Insufficient ring pressure
4. Excessive operating temperatures

5-16. When a piston ring breaks because of insufficient end gap, it will have (a) bright spot(s) on what part(s) of the ring?

1. Upper side
2. Lower side
3. Ends
4. Face

5-17. When fitted to a liner, if a piston ring lacks sufficient pressure to return to its original shape, what is the ring likely to do?

1. Wear in place
2. Seize and buckle
3. Bind in the groove
4. Break under pressure

5-18. Which of the following conditions probably causes the greatest amount of wear on piston rings?

1. Worn cylinder liners
2. Abnormal carbon deposits
3. Insufficient gap clearance
4. Excessive operating temperatures

5-19. Which of the following positions is recommended for piston ring gaps in order to allow for cylinder wear?

1. All gaps in line with the piston bosses only
2. All gaps 90° out of line with the piston bosses
3. All gaps staggered alternately 90° with the piston bosses
4. All gaps in line with the piston bosses and alternate rings staggered 180°

5-20. A ridge in a cylinder liner must be removed when piston rings are replaced in order to prevent the

1. bottom ring from cracking
2. top ring from slipping down
3. top ring and the land from breaking
4. rings from slipping too close together

5-21. If you want to determine the amount of wear on a piston assembly, you should measure only those areas that

1. make contact
2. are scored
3. appear to be worn
4. are pitted

5-22. Which of the following means are used to lubricate piston pin bushings?

1. Splash oil
2. Pressure oil
3. Mechanical oilers
4. Oil rings

5-23. The interchangeability of piston-pin bushing inserts is dependent on the location of the

1. oil holes
2. piston pin
3. needle bearing
4. pin bushing

5-24. Primarily, why are piston pin bushings reamed?

1. To obtain larger oil holes
2. To obtain correct lubricating flukes
3. To obtain proper bore clearance
4. To correct oil hole positioning

5-25. Which of the following troubles can be caused by misalignment of the connecting rod?

1. Binding of the piston
2. Binding of the piston pin
3. Binding of the connecting rod journal bearing
4. All of the above

5-26. Which of the following tools should you use to prevent overtightening of connecting rod bolts?

1. Socket wrench
2. Torque wrench
3. Strain gauge
4. Thickness gauge

5-27. Which of the following connecting rod troubles is likely to occur because of overstress?

1. Cracked rods
2. Misaligned rods
3. Out-of-round bearing bores
4. Plugged oil passages in the rods

● Question 5-28 is to be judged True or False.

5-28. You should repair by welding or brazing any cracked connecting rods discovered during engine overhaul.

Learning Objective: Point out some of the causes of engine shaft and bearing failure and indicate methods of reducing the most commonly encountered troubles

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5-29. What is the usual cause of fatigue failure of the crankshaft journal bearings?

1. Loose bearing shells
2. Improper lubrication
3. Cyclic peak loads
4. Each of the above

5-30. What effect will extreme overspeeding of an internal combustion engine have on the main journal bearings?

1. Failure of the upper halves only
2. Failure of the lower halves only
3. Either 1 or 2 above
4. Failure of both the lower and the upper halves

5-31. Which of the following factors could be the cause of crankshaft fatigue failure?

1. Improper functioning of the vibration damper
2. Improper quenching or balancing by the manufacturer of the crankshaft
3. Flexing of the crankshaft under load
4. All of the above

5-32. The crankshaft of a reciprocating engine may be responsible for which of the following conditions?

1. Lineal impulses
2. Natural vibrations
3. Torsional impulses
4. Natural frequencies

● Questions 5-33 and 5-34 are to be judged True or False.

5-33. The term "critical speeds" applies to all moving members of machinery with the exception of reciprocating-type engines.

5-34. Continuous engine operation within the critical speed range may result in breakage of the crankshaft and connecting rod bearing difficulties.

5-35. Assume a propulsion diesel engine has a tachometer with the area between 700 rpm and 750 rpm conspicuously marked in red. The speeds within this range are the

1. maneuvering engine speeds
2. critical engine speeds
3. most efficient operating speeds
4. smoothest operating speeds

5-36. To reduce torsional fluctuations and ensure smoother operation, some diesel engine crankshafts are equipped with which of the following devices?

1. Vibration dampers
2. Flexible couplings
3. Shock absorbers
4. Flywheels

5-37. Which of the following lubricants is/are harmful to the rubber of elastic-type vibration dampers?

1. Lube oil
2. Diesel oil
3. Light grease
4. All of the above

5-38. Which of the following engine noises indicates an improperly functioning vibration damper?

1. Grinding noises at low speeds
2. Clinking noises during starting
3. Rumbling noises at normal speeds
4. Humming noises at high speeds

● Question 5-39 is to be judged True or False.

5-39. Crankshaft failure may result from excessive main bearing clearances that allow an uneven distribution of the engine load during operation.

5-40. You can help keep engine journal bearings from wearing out-of-round by preventing which of the following conditions?

1. Inadequate lubrication and journal bearing failure
2. Overloading or overspeeding of the engine
3. Excessive crankshaft deflection and misalignment of parts
4. All of the above

5-41. Which of the following actions is likely to cause excessive crankshaft deflection?

1. Overloading
2. Overspeeding
3. Insufficient lubrication
4. Excessive operating temperatures

5-42. What valve assembly trouble is likely to score the camshaft cams of an engine?

1. A worn rocker arm bushing
2. A broken tapped screw
3. A chipped valve spring
4. An improperly seated push rod spring

5-43. Which of the following inspections to the valve actuating linkage should be made at frequent intervals during engine operation?

1. Inspections for improperly seated valve springs
2. Inspections for grooved or scored cam follower surfaces
3. Inspections for improperly seated push rod end fittings
4. All of the above

5-44. What is the danger in using an engine lubricating oil that has a viscosity higher than recommended?

1. Rapid absorption of acids
2. Rapid absorption of carbon particles
3. Surface pitting of bearings
4. Overlubrication

● Question 5-45 is to be judged True or False.

5-45. When a bearing fails because of an inadequate bond between the bearing metal and the bearing shell, the bearing shell shows through the bearing surface.

5-46. Crankshaft journals that exceed the specified tolerances for out-of -roundness should be refinished by which of the following means?

1. Stoning
2. Grinding
3. Filing
4. Scraping

5-47. A rough spot or ridge located on a crank pin journal should be removed by dressing with which of the following materials?

1. 4 fine sandpaper
2. A crocus cloth
3. A fine oil stone
4. Both 2 and 3 above

5-48. What damage may result to a crank pin bearing when the piston bushing bore and connecting rod bore are not in alignment?

1. Cracking at the opposite ends of the lower and upper halves
2. Cracking at the same ends of the lower and upper halves
3. Wiping at the opposite ends of the lower and upper halves
4. Wiping at the same ends of the lower and upper halves

5-49. What is indicated when the back of a bearing shell contains a gumlike varnish deposit?

1. Excessive bearing clearance
2. Normal bearing wear
3. Low operating temperatures
4. Lack of lubrication

5-50. If the lower shell of a journal bearing is interchanged during installation with a plain upper shell, what, if anything, happens to the oil flow in the bearing?

1. It decreases
2. It increases
3. It stops
4. Nothing, it remains the same

5-51. Bearing lubrication is poorest when the engine is being

1. overloaded
2. idled
3. started
4. stopped

5-52. What is the purpose of motor-driven lube oil pumps used on diesel engines?

1. To increase the pressures obtainable from the engine-driven pumps
2. To service the engine gear training and bearings during normal operation
3. To lubricate the bearings before engine operation
4. To increase the flow during engine operation

5-53. In order to check for abrasive elements in the lubricating oil of an engine, the oil samples should be obtained regularly from which of the following sources?

1. The most accessible point in the lube oil system
2. The lowest point in the sump
3. The oil filter element
4. The lube oil pump

5-54. What part of a frictionless bearing should you inspect for signs of pitting and surface cracks?

1. Inner surface of the inner race
2. Outer surface of the inner race
3. Inner surface of the outer race
4. Outer surface of the outer race

5-55. Which of the following actions may cause dented races in the antifriction bearings that support heavy shafts?

1. The application of too much pressure when the bearings are installed
2. The application of too much pressure when the bearings are removed
3. The application of vibration to the bearings when the shafts are idle for a long time
4. Each of the above

5-56. A frictionless bearing is always replaced when an inspection reveals which of the following problems?

1. It is difficult to operate by hand
2. It has brinelled races
3. It operates noisily
4. It is dirty

5-57. Only one race of an antifriction bearing is made a press fit because it is highly desirable to have the other race

1. abrade
2. creep
3. removable
4. unloaded

● Questions 5-58 and 5-59 are to be judged True or False.

5-58. The only way to tell if a bearing has a cracked race is by a visual inspection.

5-59. The best way to determine if excessive looseness exists in a frictionless bearing is to compare the bearing suspected of being loose with d new bearing.

5-60. What is the probable cause of looseness in an oiled roller bearing?

1. Improper adjustment
2. Improper installation
3. Abrasives in the oil
4. Faulty oil seal

Learning Objective: Recognize the purpose and types of auxiliary drive mechanisms; and specify the general inspection and maintenance requirements.

5-61. What is the purpose of the chain drive mechanism that drives the blower on a diesel engine?

1. To reduce the speed of rotation of the blower
2. To increase the speed of rotation of the blower
3. To time the operation of the blower in the correct sequence of events with the operation of the engine
4. To prevent overspeeding of the blower

5-62. What gears are used in the gear train for the auxiliary mechanisms of most internal combustion engines?

1. Bevel gears
2. Single helical spur gears
3. Double helical spur gears
4. Worm gears

5-63. Most internal combustion engine drive gears are constructed of which of the following materials?

1. Steel
2. Cast iron
3. Bronze
4. Fiber

5-64. What is the function of idler gears in a timing train?

1. To reduce the speed of the camshaft
2. To increase the speed of the camshaft
3. To reduce vibrations in the gear train
4. To transfer the rotation of the crankshaft over a considerable distance

5-65. What is the speed of the camshaft in a four-stroke cycle engine when the crankshaft is turning 920 rpm?

1. 230 rpm
2. 460 rpm
3. 690 rpm
4. 920 rpm

● Question 5-66 is to be judged True or False.

5-66. A longitudinal movement may be produced by an operating gear in a train that is secured with a loosely fitted woodruff key.

5-67. What is the purpose for marking the teeth in an engine gear train as shown in figure 3-24 of your textbook?

1. To indicate the gear diameters
2. To provide a means for mating the gears
3. To identify the size of the gear teeth
4. To indicate the number of gear teeth

5-68. If the bushing clearances on the timing gear train exceed the allowable limit, the bushings should be

1. aligned
2. adjusted
3. reshimmed
4. renewed

5-69. If the only defect found in the auxiliary drive gears is a chipped gear tooth, which of the following actions should you take?

1. Rebuild the tooth by welding
2. Smooth the chipped area by filing
3. Replace the gear
4. Realign the gear

5-70. When the backlash of a blower rotor gear set exceeds the manufacturer's specified limit, what must you do?

1. Replace the gears
2. Replace the rotors
3. Retime the gears
4. Reshim the rotors

5-71. Excessive backlash of the blower rotor drive gears may cause scoring of which of the following parts?

1. Blower casing
2. Shim plates
3. Shaft seals
4. Blower lobes

5-72. An estimate of the life of a Roots blower rotor gear can be determined by which of the following methods?

1. A comparison of charts showing the average use and wear with records of the use of the particular machine
2. 4 careful study of records of the amount of wear as recorded periodically
3. A study of the manufacturer's estimates of lifetime of the gear for the engine
4. A computation of the amount of use the machine will receive and the type of gear used

5-73. When one of the blower rotor drive gears indicates a slight tooth fracture, what should you do?

1. Replace the gear with one from another set
2. Replace the gears with a matched set
3. Align the gears to prevent further damage
4. Install additional shims to relieve tooth contact

5-74. Failure of a properly aligned and adequately lubricated chain drive mechanism may be caused by which of the following parts?

1. Sheared cotter pins
2. Binding joint pins
3. Both 1 and 2 above
4. Worn chain links

5-75. After a long period of operation, how is a chain drive usually adjusted?

1. By peening the connecting link pins
2. By tightening the chain tension
3. By replacing the connecting pin
4. By realigning the idler gears